Document Title:	Function Group:	Information Type:	Date:
Description, general	**900**	**Service Information**	**2014/12/22**
Profile: **EXC, EC210C L, EC160C L, EC180C L [GB]**			

Description, general

The machine is equipped with a positive flow control system with variable flow. With this system, the working pump can deliver flow according to demand. A variable flow from the pump allows precision work even with high engine speed.
The hydraulic system, also known as the "Automatic Sensing Work Mode," is designed for high-productivity, high-digging capacity, high-maneuvering precision and excellent fuel economy. The summation system, boom, arm and swing priority along with boom and arm regeneration provides optimum performance.

The following important functions are included in the system:

- Summation system: Combines the flow of both hydraulic pumps to ensure quick cycle times and high productivity.
- Boom priority: Gives priority to the boom operation for faster raising when loading or performing deep excavations.
- Swing priority: Gives priority to swing functions for faster simultaneous operations.
- Regeneration system: Prevents cavitation and provides flow to other movements during simultaneous operations for maximum productivity.
- Power boost: All digging and lifting forces are increased.
- Holding valves: Boom and arm holding valves prevent the digging equipment from creeping.

The following functions are included in the main control valve :

- Boom
- Dipper arm
- Bucket
- Slew
- Travel
- Optional equipment, X1

The optional control valve has the following functions:

- Adjustable boom, X2
- Optional equipment, X3
- line rupture for boom and arm

Document Title: **Hydraulic system, description**	Function Group: **900**	Information Type: **Service Information**	Date: **2014/12/22**
Profile: **EXC, EC160C L, EC180C L [GB]**			

Hydraulic system, description

The machine's hydraulic system is divided into two subsystems - the working hydraulic system and servo hydraulic system.

All power transmission is via hydraulic oil in the **working hydraulic system**.

A working pump supplies the main valve block with oil. The main valve block distributes the oil to the digging equipment's four (five split boom) hydraulic cylinders and the two hydraulic motors for travel and slew. The flow of oil to the different movements is controlled with valve spools in directional valves.

The **servo hydraulic system** is used for control.

A servo pump supplies the control levers and pedals with servo pressure. When the machine is operated, the control pressure valves reduce the servo pressure to a control pressure, which activates the directional valves.

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Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Hydraulic oil, description	**900**	**Service Information**	**2014/12/22**
Profile: **EXC, EC460C L, EC330C L, EC240C L, EC290C L, EC360C L, EC180C L, EC160C L, EC210C L [GB]**			

Hydraulic oil, description

The oil contains selected additives that provide good oxidation stability, corrosion protection and good lubricating characteristics as well as compatibility with bearings containing lead alloys.

The ester base gives the oil a very high viscosity index and good characteristics at low temperatures.

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Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Hydraulic system, repair of hydraulic components in workshop	**900**	**Service Information**	**2014/12/22**
Profile: **EXC, EC210C L, EC160C L, EC180C L, EC460C L, EC330C L, EC240C L, EC290C L, EC360C L [GB]**			

Hydraulic system, repair of hydraulic components in workshop

- Always wear clean coveralls and be strict about personal cleanliness.
- Work on hydraulic components should be performed separate from other work in a so-called "clean room". The room must have good ventilation and the floor must be coated with a binding material. Machining, grinding and similar work is not allowed in the "clean room".
- The workplace must be equipped with thoroughly cleaned tools and suitable containers for cleaning hydraulic components.
- Containers for cleaning hydraulic components must not be used for other cleaning. The containers must be cleaned frequently and filled with new fluid. The containers must be equipped with a removable grating on the bottom, which separates the component from any sludge on the bottom.
- Always clean components that are going to be handled in the "clean room". If an alkaline detergent is used, it should contain anti-corrosion agent.
- Always plan work on the hydraulic system so that it can be completed without any longer interruptions.
- When cleaning during repairing – use dry and clean compressed air for drying, do not use cotton waste or rags.
- Always plug a component when work is completed, use clean plastic plugs of the correct dimensions, and pack the component.
- When cleaning in the "clean room" – use methods that do not stir up dust or dirt.

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Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Hydraulic oil, storage and handling	**900**	**Service Information**	**2014/12/22**
Profile: **EXC, EC210C L, EC160C L, EC180C L, EC460C L, EC330C L, EC240C L, EC290C L, EC360C L [GB]**			

Hydraulic oil, storage and handling

- Hydraulic oil should be stored in tightly sealed tanks or barrels.
- Only containers used for transporting hydraulic oil should be used for this purpose.
- Oil should be stored under cover or in temperature-controlled premises. If oil is stored outdoors, the barrels should be stored horizontally so that water cannot enter and the barrel markings are not eradicated.
- Oil must not be stored at temperatures exceeding 60 °C, or be exposed to direct sunlight or freezing temperatures.

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Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Hydraulic system, cleanliness when handling hydraulic components	**900**	**Service Information**	**2014/12/22**
Profile: **EXC, EC210C L, EC160C L, EC180C L, EC460C L, EC330C L, EC240C L, EC290C L, EC360C L [GB]**			

Hydraulic system, cleanliness when handling hydraulic components

WARNING

Hot hydraulic oil and hydraulic oil under pressure may result in severe personal injuries

NOTICE

It is very important to keep the hydraulic system free from any impurities, as these can cause abnormal wear and may lead to expensive downtime. Greatest possible cleanliness should be maintained during all handling of hydraulic components and hydraulic oil.

NOTE!

A vacuum pump should be used for work on the hydraulic system, see 900 Vacuum pump, connection.

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Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Hydraulic components, storage and transport	**900**	**Service Information**	**2014/12/22**
Profile: **EXC, EC210C L, EC160C L, EC180C L, EC460C L, EC330C L, EC240C L, EC290C L, EC360C L [GB]**			

Hydraulic components, storage and transport

- All hydraulic components must be stored in plastic bags or film and they must be plugged. The packaging must not be opened before use of the component.
- Service vehicles should be equipped with an interior which facilitates good order and cleanliness.
- Each service vehicle should carry a roll of plastic film, plastic plugs of the most common sizes and plastic containers for components. Plugs and film should be of the disposable type.

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Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Hydraulic system, work instructions	**910**	**Service Information**	**2014/12/22**
Profile: **EXC, EC210C L, EC160C L, EC180C L, EC460C L, EC330C L, EC240C L, EC290C L, EC360C L [GB]**			

Hydraulic system, work instructions

- Always wear clean coveralls and be strict about personal cleanliness.
- Perform thorough troubleshooting to avoid unnecessary repair work.
- If necessary, move the machine, to as dust-free an environment as possible.
- If possible, do not dismantle components in the field. Use exchange components.
- Protect both replaced components and components that are to be reused by wrapping them in plastic film.
- If the tank is to be drained, and the oil has been found to be free of discolouration and impurities – drain the oil into clean containers, and seal securely. Refilling of this oil or filling of new oil should always be performed by removing the hydraulic oil filter cap and then filling through the filter.
- Use a suitable fluid when cleaning and pour it into a thoroughly cleaned container.

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Construction Equipment

Service Information

Document Title: **Hydraulic components, description**	Function Group: **910**	Information Type: **Service Information**	Date: **2014/12/22**
Profile: **EXC, EC210C L, EC160C L, EC180C L [GB]**			

Hydraulic components, description

This machine incorporates the features and functions described below in its hydraulic circuit in order to provide easier operation, greater safety, higher productivity, and better fuel economy.

Function of components

Purpose	Component	Function	Feature
Ease of operation and safety	Travel	• Controlled by servo hydraulic pressure • Straight travel • Low speed, low/high speed automatic shift	• Straight travel during simultaneous operations. • Automatic shifting between low and high speed.
	Slew	• Slew priority circuit (during simultaneous slew and arm in) • Automatic slew parking brake • Rebound damping function	• Easier digging due to the use of simultaneous slew and arm in. • Delayed slew parking brake application during slew to allow for inertia. • Damping by rebound damping valve.
	Digging units	• Controlled by servo hydraulic pressure • Boom priority circuit (during simultaneous loading or performing deep excavations) • Arm priority circuit (during simultaneous digging) • Boom, arm and bucket regenerating circuit • Holding valve (boom, arm lock) • Heavy lift and heavy duty digging	• Fine operation. • Changing the balance between boom, arm and bucket functions. • Decreasing the amount of natural fall of boom when the boom is at rest. • Increasing the working pressure by increasing the pressure of main relief valve.

	Others	• Closed and semi automatically pressurized hydraulic tank • Suction strainer • Return line: filter and drain filter • Servo hydraulic circuit: line filter • Hydraulic oil cooled by oil cooler • Emergency circuit	• Contamination of hydraulic oil prevented, suction ability of pump improved. • Damage of hydraulic components prevented. • Contamination of hydraulic oil prevented. • Servo hydraulic operated circuit failure prevented. • Deterioration of hydraulic oil prevented. • If engine stopped, movable by weight of digging units.
Productivity increased	Pump	• Full horsepower control	• Effective use of engine horsepower though action of two variable displacement pumps.
	Travel	• 2–speed auto shift by the 2–speed track motor	• Low speed/high propel torque. • High speed/low propel torque.
	Digging units	• Conflux for boom raising • Regeneration for boom lowering • Conflux circuit for arm in under heavy load • Conflux circuit for arm in under light load • Conflux circuit for arm out • Conflux circuit for X1 (option) • Pressure increasing circuit for heavy load	• Faster boom raising. • Positive bucket motion during simultaneous boom lowering and bucket operation. • Faster arm in under heavy load. • Faster arm in under light load. • Faster arm out. • Faster X1 operation. • Improved digging, lifting under heavy load.
Fuel economy	Pump	• Positive flow control	• Flow minimized when in neutral
	Controller	• Mode select switch changeover • Auto idling	• Selecting an effective engine rpm suited for the amount of work, fuel consumption and fine control. • Engine speed decelerated during waiting periods for reduced fuel cost and less noise.

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Construction Equipment

Service Information

Document Title: **Hydraulic diagram, schematic**	Function Group: **910**	Information Type: **Service Information**	Date: **2014/12/22**
Profile: **EXC, EC160C L, EC180C L [GB]**			

Hydraulic diagram, schematic

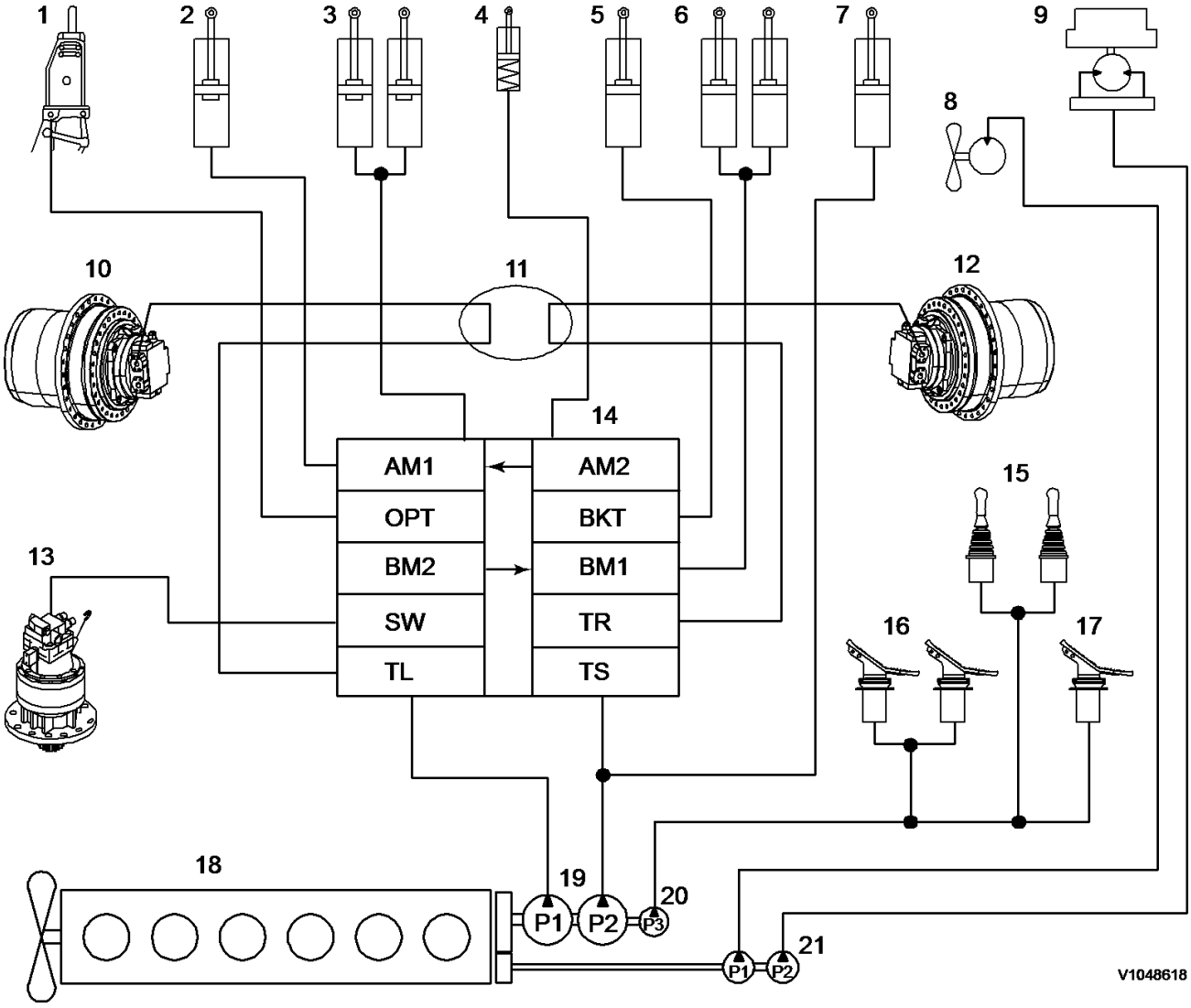

Figure 1
Hydraulic diagram

1	Hydraulic hammer (X1)	8	Fan motor	15	Remote control valve (lever)
2	Arm cylinder	9	Rotator (X3)	16	Remote control valve (pedal)
3	Dozer blade cylinder	10	Travel motor (left)	17	Remote control valve (pedal)
4	Quckfit cylinder	11	Center passage	18	Engine
5	Bucket cylinder	12	Travel motor (right)	19	Main hydraulic oil pump
6	Boom cylinder	13	Slew motor	20	Servo hydraulic oil pump
7	Adjustable boom cylinder (X2)	14	Main control valve	21	Gear pump (fan motor, rotator (X3)

The mechanical power from the engine is converted to hydraulic power by the main pumps. Hydraulic power from the main pumps goes to the track motors, slew motor and hydraulic cylinders via the control valve, where it is converted back to mechanical power, which actuates the travel action, slew action and digging units.

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Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Hydraulic system, position of main components	**910**	**Service Information**	**2014/12/22**
Profile: **EXC, EC160C L, EC180C L [GB]**			

Hydraulic system, position of main components

See 990 Hydraulic diagram, with option components

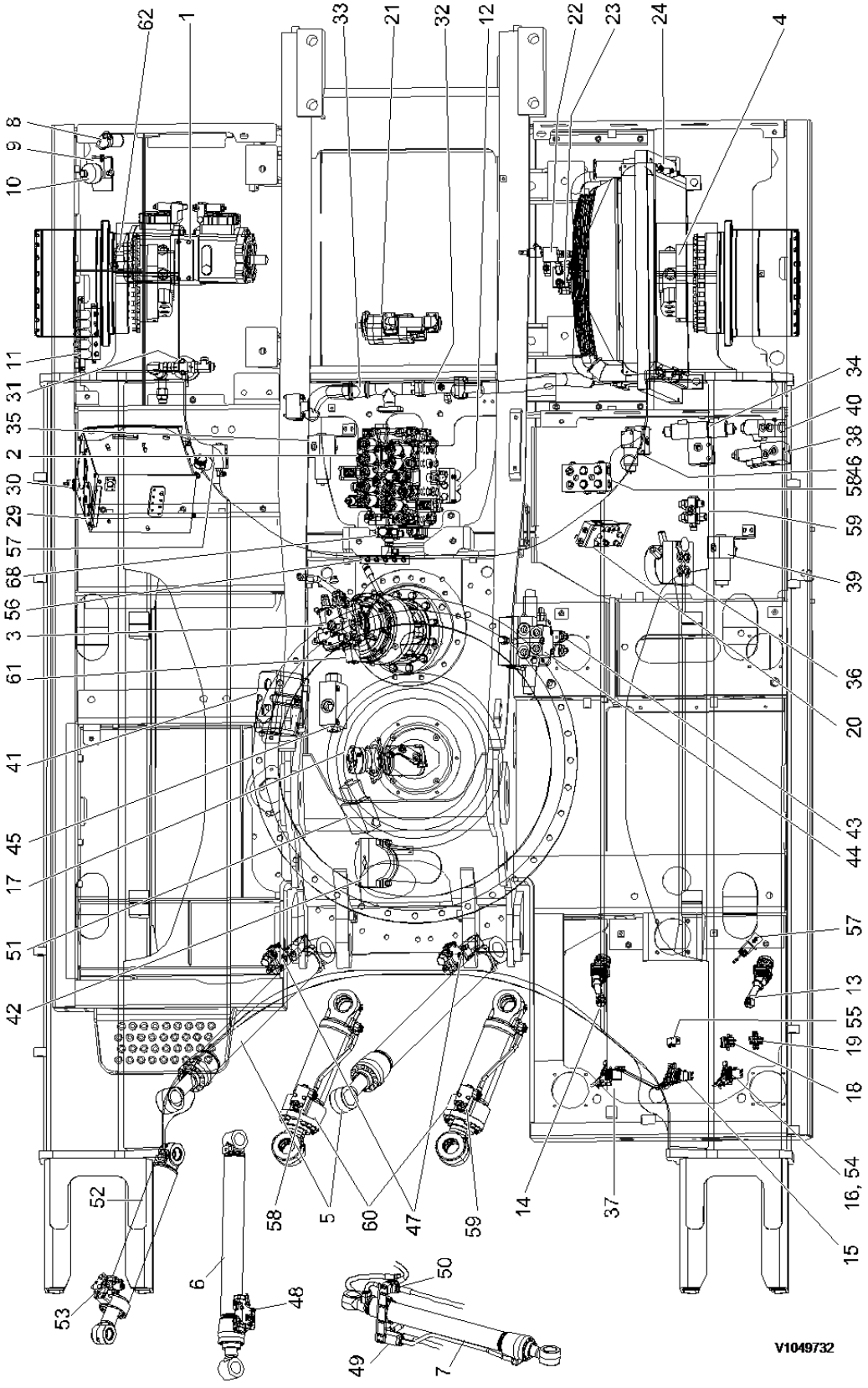

Figure 1
Hydraulic system's main components

1 Main pump

2 Main control valve

3 Slew motor

23 Fan motor

24 Hydraulic oil cooler

25 Return filter

46 Solenoid valve (float position)

47 Boom hose rupture valve

48 Arm hose rupture valve

4 Track motor
5 Boom cylinder
6 Arm cylinder
7 Bucket cylinder
8 Servo hydraulic oil filter
9 Accumulator block
10 Accumulator
11 Solenoid valve
12 Solenoid valve
13 Remote control valve (lever), left
14 Remote control valve (lever) - right
15 Remote control valve (pedal)
16 Remote control valve (Straight travel)
17 Center passage
18 Shuttle valve (travel)
19 Shuttle valve (Straight travel)
20 Shuttle valve (attachment)
21 Gear pump (cooling and X3)
22 Proportional relief valve (PWM9103)
26 Bypass valve
27 Bypass strainer
28 Suction strainer
29 Hydraulic oil tank
30 Air breather
31 Drain filter
32 Check valve : 0.147 MPa (1.5 kgf/ cm2) (21 psi) (1.47 bar)
33 Check valve : 0.44 MPa (4.5 kgf/cm2) (64 psi) (4.4 bar)
34 Solenoid valve (Hammer & Shear
35 Proportional valve (PWM9109)
36 Control pattern selector valve
37 Remote control valve (X1 pedal - option)
38 X1 proportional valve
39 Solenoid valve (2 pump flow)
40 Solenoid valve (thumb bucket)
41 3-way selector valve
43 X3 proportional valve)
44 X3 valve
45 Float position valve
49 Non leak valve (S)
50 Non leak valve (L)
51 Quickfit valve
52 Adjustable boom cylinder
53 Adjustable boom valve
54 Remote control valve (X2 pedal)
55 Servo hydraulic block
56 Servo hydraulic block
57 Servo hydraulic block
58 Servo hydraulic block
59 Shuttle valve
61 Time delay valve
62 Servo hydraulic oil pump
63 Check valve
64 Check valve
65 Dozer blade cylinder
66 Dozer blade cylinder
67 Remote control valve (Dozer blade)
68 Shuttle valve (Dozer blade)

Document Title: **Hydraulic tank, description**	Function Group:	Information Type: **Service Information**	Date: **2014/12/22**
Profile: **EXC, EC210C L, EC160C L, EC180C L [GB]**			

Hydraulic tank, description

The hydraulic oil tank is a welded sheet metal construction which stores the hydraulic oil and facilitates separation of impurities, water and air.

The hydraulic oil tank is common to the working and servo hydraulic system. The tank is equipped with a monitor for the return filter and sensor for oil temperature. The oil level can be read off manually on the level indicator which is mounted on the hydraulic oil tank left side of the hydraulic oil pump room.

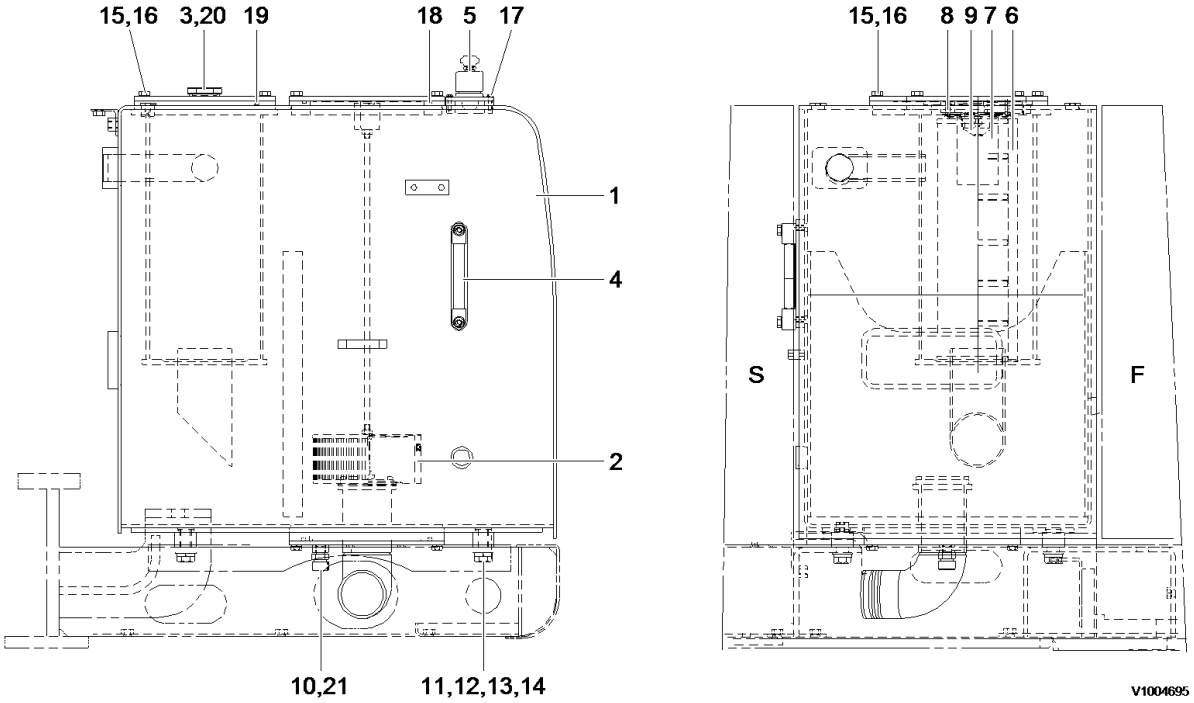

Figure 1
Structure, hydraulic tank

1	Hydraulic tank	8	Spring	15	Spring washer
2	Strainer (80 mesh)	9	Bypass valve	16	Screw
3	Plug	10	Drain valve	17	Screw
4	Sight gauge	11	Shim	18	O-ring
5	Air breather	12	Spring washer	19	O-ring
6	Element strainer	13	Plain washer	20	O-ring
7	Strainer-by pass	14	Screw	21	Copper gasket
S	Side door				
F	Fuel tank				

Tightening torque : unit : kgf·m (lbf·ft)

No.	Tightening torque

3	2.5 ± 0.3 (18 ± 2.2)
4	1.5 ± 0.2 (10.8 ± 1.4)
10	4.5 ± 0.5 (32.5 ± 3.6)
14	52.2 ± 5.2 (377 ± 38)
16	6.5 ± 0.7 (47 ± 5)
17	0.3 ~ 0.6 (2.2 ~ 4.3)

- To check the oil level, park on a level surface, retract the arm cylinder, extend the bucket cylinder, lower the bucket to the ground and stop the engine.
- Operate each control lever (for digging unit and travel) to its full stroke to release the residual pressure.
- The center line of the sight gauge is normal. Add oil when required.

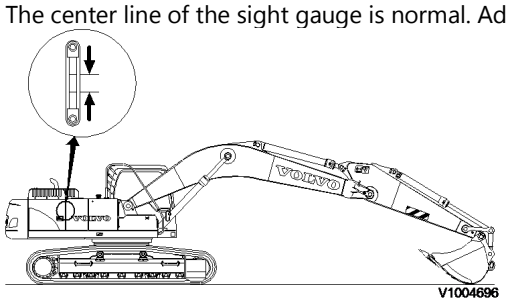

Figure 2
Oil level sight gauge

- When mounting the tank, make the bottom level with frame by use of shim (11).
- Maintain the clearance (front, rear, left, right) within 10 mm (0.4 in).

Oil filter bypass valve

When the filter is clogged

Figure 3
Oil flow, when the filter is clogged

A. From main control valve

Bypass valve (1) is opened and the oil returns directly to the tank without passing through the filter.

NOTE!
Bypass valve set pressure : 1.5 ± 0.15 kgf/cm2 (21.3 ± 2.1 psi)

Air breather

Preventing negative pressure inside the tank

The tank is a pressurized sealed type, so negative pressure is formed inside the hydraulic tank when the oil level drops during operations. When this happens, the difference in pressure between the tank and the outside atmospheric pressure opens the poppet in the breather, and air from the outside is let into the tank to prevent negative pressure.
At that time filter (2) prevents contamination from entering the tank.
1) Relief set pressure : 0.5 ± 0.1 kgf/cm2 (7 ± 1.4 psi)
2) Suction set pressure : 0.05 ± 0.01 kgf/cm2 (0.7 ± 0.14 psi)

Preventing excessive pressure inside the tank

When the hydraulic actuators are operated, the oil level in the hydraulic system increases as temperature rises. If the hydraulic pressure rises exceeding the set pressure, the breather is actuated to release the hydraulic pressure inside the tank.

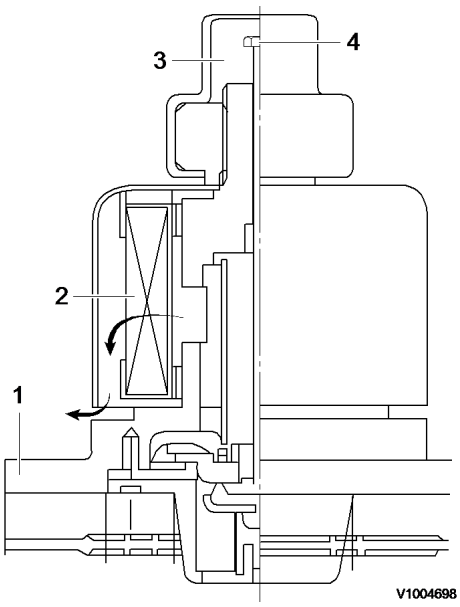

Figure 4
Air breather

1	Body	3	Cap
2	Filter	4	Valve

Hydraulic tank pressurizing

The hydraulic tank is pressurized to create a positive pressure at the hydraulic pump inlet to prevent cavitation.

If the tank cap assembly does not function or seal properly, the hydraulic pump could be damaged.

To pressurize the tank, raise the boom to maximum height, extend the arm and bucket cylinders, then lower the boom to the ground.

To prevent hydraulic oil ejection due to the tank internal pressure while hydraulic system maintenance, press the inner button several times to release the pressure until the air is all out.

Document Title: **Hydraulic oil tank, vacuum-pumping, connecting and disconnecting pump**	Function Group:	Information Type: **Service Information**	Date: **2014/12/22**
Profile: **EXC, EC160C L, EC210C L, EC180C L, EC240C L, EC290C L [GB]**			

Hydraulic oil tank, vacuum-pumping, connecting and disconnecting pump

Op nbr 911-040

14 360 000 Vacuum pump

NOTICE

Connection of the vacuum pump must be performed with the diesel engine off. The air filter is placed above the filtered hydraulic oil. Therefore, carefully clean the surfaces closest to the filter. Do not leave the connection to the filter open for longer than it takes to fit the adapter.

NOTE!
There is always a risk of air entering the hydraulic system when using a vacuum pump.

NOTE!
See : 9111 Breather, replacing

1. Place the vacuum pump on the hydraulic oil tank.

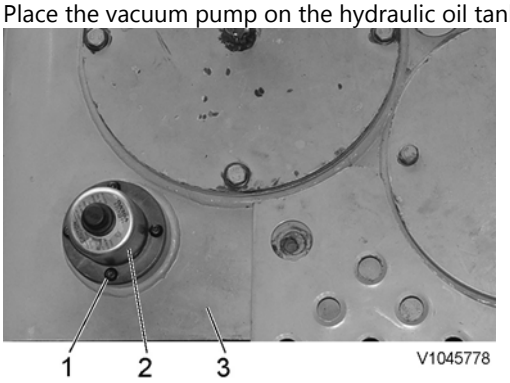

Figure 1
Remove air breather

2. Remove screws (1) and air breather (2) from hydraulic oil tank (3).

3. Install adapter (2) and connect hose (1) to the adapter.

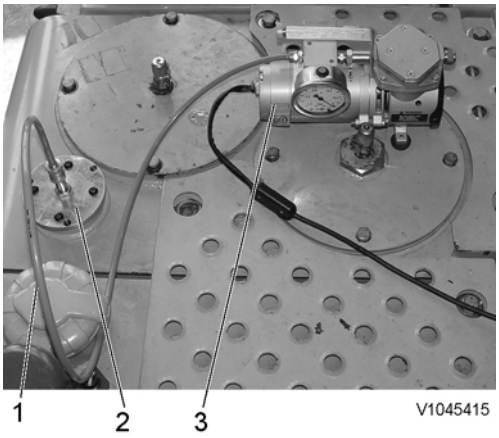

Figure 2
Connection of vacuum pump

1. Hose
2. Adapter
3. Vacuum pump

4. Connect the plug to the 24 V socket behind the operator's cab.

5. Start the vacuum pump.

6. Run the pump for 2–3 minutes until a negative pressure reading of –30 kPa (–4.35 psi) is obtained.

7. Adjust the vacuum pressure with the adjusting knob so that oil leakage will not occur during work on the hydraulic system.

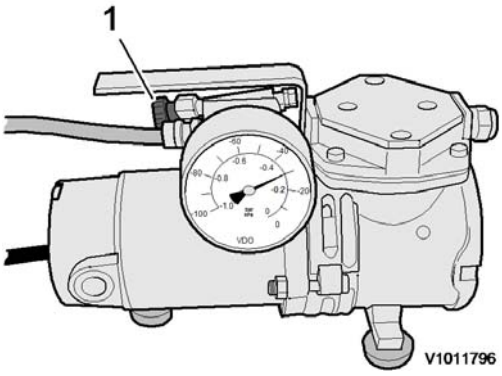

Figure 3
Vacuum pump

1. Adjusting knob

IMPORTANT! The pressure must not fall below –30 kPa (–4.35 psi), as otherwise there is a risk of damage to the hydraulic oil tank.

8. Turn off the electric power to the vacuum pump.

9. Remove the plug from the 24V socket.

10. Remove the hose from the adapter.

11. Remove the adapter and immediately fit the air breather.